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CAN AMERICANS BE SCIENTISTS?

Our Contributions to Physical Science

BY JOSEPH MAYER

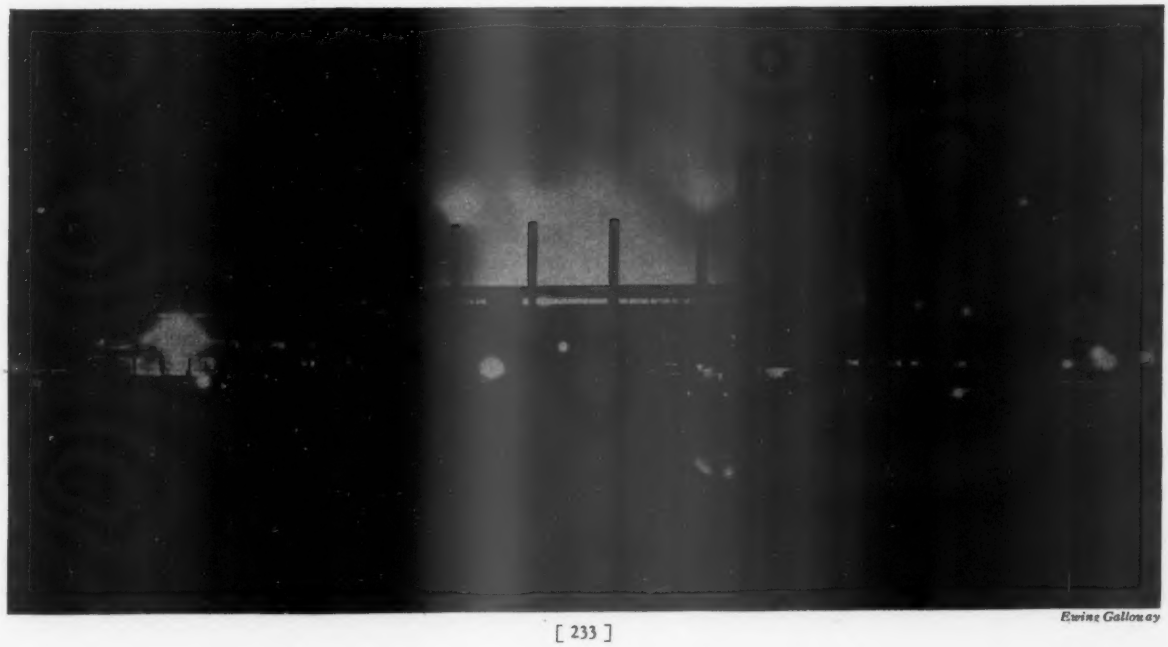
WE are a great business people, but superficial, materialistic and quite untouched by considerations of scholarly tradition — such is the usual estimate of the United States vouchsafed by Europeans and generally accepted by Americans, sometimes with pride. To most of the outside world, and to some of us, the United States is the nation of the almighty dollar and little else.

When Edison, Bell, and the Wright brothers are named and a share in the development of science is claimed through them, the critics hasten to concur only to adduce this as proof strengthening their assertion, since these men have applied the results of scientific achievement to the practical arts only, and have seemingly left us as far as before from the plane of Galileo and Newton.

And yet this estimate is entirely false, as the following pages will indicate, for instead of being but negligible laggards after science, America today definitely leads the vanguard with three other nations, Germany, England and France. We have produced at least ten times as many great scientists in the last century as has, for example, Italy, the home of Galileo.

As a preliminary to tracing the path of America's progress in the development of science, we shall first consider conditions at home and abroad 200 years ago when America was in her infancy and when modern science the world over was very young.

European universities at that time had already been established for over 500 years, literary and scholastic efforts and ideals had taken vigorous root, research facilities were already extensive, and Europe was in the midst of the scientific Renaissance. England had come through her political revolution and most of the Continental nations were established.



Ewing Galloway

HENRY AUGUSTUS ROWLAND (1848–1901), GREAT PHYSICIST OF JOHNS HOPKINS

Yet how many great scientists had Europe produced before 1729? Hardly more than twenty outstanding names measure the achievement of all Europe in all branches of science, from Roger Bacon in the Thirteenth Century to Newton in the early Eighteenth; eight Englishmen, four Italians, three Germans, one Hollander, one Pole, one Belgian, one Frenchman and one Dane standing forth prominently, with another half dozen that might be added. And if we limit this count to mathematics, theoretical astronomy and mechanics, the only branches of science securely grounded in these 500 years, half this number covers the record of attainment. In the physical sciences only two conspicuous contributors per century was Europe's average up to 1729. Chemistry, geology, biology and psychology were then mere labels for unsolved problems, labels largely unintelligible, for these fields had as yet not even begun to be cleared of superstition and crass misconception. Of the premier mathematicians and physical scientists during this half a millennium it is hard to find a single name to add to Roger Bacon, da Vinci, Copernicus, Descartes, Gilbert, Kepler, Galileo, Boyle, Huygens, Leibnitz and Newton.

Compare this half millennium of Europe's scientific beginnings with America's single century from the landing of the Pilgrims in New England. During this shorter period isolated outposts of civilization in a vast wilderness had been hewn and held in the midst of savagery; only unceasing vigilance kept the hostile Indians at bay, and only unceasing toil wrested the land into productivity. America's most bitter critics stay their slings when they look upon the record of this early colonial period of hardship and misery, when the young colonies were battling with elemental dangers and struggling for a foothold to live. Under these conditions, how produce even one conspicuous physical scientist? Yet even then, in the early Eighteenth Century, this youngest and poorest equipped of the nations in things scholarly somehow found time between taming the earth and fighting the Indian to produce two of the world's greatest physicists, Benjamin Franklin and Count Rumford, besides several other physical scientists worthy of mention.

Benjamin Franklin (1706–1790) was an established educator, newspaper correspondent and literary writer in Philadelphia, and had founded the *Saturday Evening Post* and the academy which later developed into the University of Pennsylvania, by the time he was forty years old. Then he began the experiments in frictional electricity which placed him among the illustrious men of science. In 1747 he advanced his famous "one-fluid" theory, which premises that all bodies possess electricity but show no signs of it unless by some means they receive a surplusage, when they may be said to be "positively charged," or lose some of their normal portion to other bodies, when they may be said to be "negatively charged." This simple explanation was quickly accepted throughout the scientific world in Europe and has sufficed even to this day to elucidate all ordinary static electrical phenomena; it is now being revived. Electricity in Franklin's day was surrounded with misconception. Weird beliefs, such as that goat's blood, garlic, melancholy and seduction influenced or were influenced by magnetic attraction, were held with regard to electrical and magnetic causes and effects, and current electricity was unknown.

In Franklin's experiments with the Leyden jar, invented not long before in Europe for the purpose of collecting and intensifying electrification by friction, he had made use of pointed rods for "drawing off and throwing off the electrical fire," as he said, and had observed the striking resemblance between the Leyden jar discharges thus effected and the phenomenon of lightning. He then determined to see if he could draw down the lightning along a silken string attached to a kite. His success in this novel and startling experiment is known to all. It won him universal recognition, honorary degrees from Oxford, Edinburgh and St. Andrews, his election as a fellow of the Royal Society, and the award by England of the famous Copley Gold Medal, recognitions than which no higher could be bestowed on any scientist in that day. And his brilliant and clarifying hypotheses cleared the field and laid the foundations for the remarkable developments which soon followed.

Not less notable was the career of Count Rumford (1753–1814). Born Benjamin Thompson, in Woburn, Massachusetts, he received his scientific training at Harvard under great difficulties and privation, and afterward went to Europe where he rapidly rose into prominence in the scientific, social, military and political life of three nations. In England he became under-secretary of state, founded the Royal Institution of London and was knighted. In Bavaria he was created Count Rumford, served as privy councilor, chief of police and minister of war, and so revolutionized social conditions in Munich as an examplar of the brotherhood of man that, when he

lay desperately ill, a foreigner and a Protestant in a Catholic community, the poor of the city spontaneously offered public prayers for his recovery. In France he married the widow of the distinguished French chemist Lavoisier and became the close friend of Napoleon, Lagrange, and Cuvier. The Czar of Russia urged him to come to St. Petersburg, and President Adams offered him the post of superintendent of the American Military Academy and inspector general of the artillery of the United States. Such a career would seem to leave little time for scientific pursuits. Yet the whole of Rumford's mature life was one vast experiment in science, whether in his plan, never fulfilled, to survey the White Mountains, his research into the action of gunpowder and projectiles and the nature of heat, his introduction of improved methods of horse breeding, or his social experiments. The whole world was his laboratory, and every experience an opportunity for research.

His chief claim to scientific distinction rests on his investigations into the nature of heat and his attack upon the theory of imponderables. This latter was a something manufactured out of whole cloth to attempt to explain well-known physical phenomena. There were several "imponderables." Thus "corpuscle" was thought to have something to do with the propagation of light; "caloric" was presumed to be a substance a body drew into itself when heated and lost when cooled; "phlogiston" was supposed to be given off by an object when burning; and "effluvium" was considered to have something to do with the behavior of electricity. The whole subject of heat was entangled in fantastic suppositions concerning the properties of "caloric" and "phlogiston." Heat and fire were both considered tangible substances. Nothing could be accomplished toward a better understanding of the various manifestations of energy so long as the imponderables continued to raise barriers between heat, light, electricity, and magnetism. Rumford suspected that heat has no material existence, and in 1798 while boring cannon in a military workshop he decided to put the caloric theory to test. His experiments convinced him that heat is a form of motion caused by friction of one body against another, and that caloric was an empty assumption. By this time the chemists had demonstrated that phlogiston also was meaningless. Hence Rumford looked forward to seeing "caloric interred with phlogiston in the same tomb." This did not happen, however, until the middle of the Nineteenth Century. But meantime Rumford's experimental proof led the way to the discrediting of other imponderables, to the reduction of all forms of energy to modes of motion in a circumambient medium, and to a focusing of attention upon the nature of the ether and the source of motion in the structure of the atom.

Thus these two native-born Americans, Franklin and Rumford, contributed preëminently to the advance of physics. Nor were there lacking other prominent American scientists of the colonial period, notably John Winthrop of Harvard, friend of Franklin and teacher of Rumford, and David Rittenhouse of Philadelphia, widely recognized astronomer of his time.

While America was producing at least four eminent physical scientists in her first century of scholarly activity, Europe in her sixth century (during the same period from 1730 to 1800) produced about a score; half of them in France, five in Great Britain, two each in Italy and Switzerland, and one in Germany. Europe's outstanding achievement in the Eighteenth Century was the establishment of chemistry by several noted Englishmen (Black, Cavendish, and Priestley) and the great Lavoisier of France, who was beheaded during the French Revolution because "*La Republique n'a pas besoin des savants*" — a democracy has no need for the learned!

THE Nineteenth Century saw unprecedented development in all branches of science. Mathematics, astronomy, physics and chemistry were fairly well under way at its beginning, and the practical applications of these sciences before it closed had literally transformed the material environment of man and laid the foundation for three new sciences, geology, biology, and psychology. The development of the sciences discloses a definite hierarchy and may be likened to a building, mathematics the foundation, physics the first floor, chemistry the second, modern astronomy the third, and geology, biology, and psychology the fourth, fifth, and sixth respectively. The Nineteenth Century laid the foundations and built the lower stories, that the Twentieth might raise the superstructure. In this steady advance the United States not only made the practical applications of science to art and industry, in which she is justly considered preëminent, but also bore her share of the work in establishing the fundamental principles of physical science without which such applications would have been impossible.

JOSIAH WILLARD GIBBS (1839–1903), THE "NEWTON OF CHEMISTRY"

Curtis & Cameron

KENYON COX'S MURAL "THE SCIENCES," IN THE LIBRARY OF CONGRESS

Turn now to a comparison of scientific achievements in America's second century of scientific activity with Europe's seventh. During this period Italy waned, Holland and Switzerland stood still, Scandinavia and Russia went forward, but none of these produced more than six scientists of note. Great Britain, the United States, France and Germany form a class by themselves in modern scientific accomplishment, each producing more than thirty scientists of outstanding excellence, with Germany showing the greatest relative advance and the United States next. But it should be added, both Great Britain and France began the Nineteenth Century with a larger number of scientists, and their absolute contributions in the succeeding hundred years were close behind those of Germany. England's impetus followed in large measure the work of Rumford, and the new world's direct contribution was worthily represented by men like Joseph Henry (1797–1878), a New Yorker prominent in mathematics and physics, an outstanding experimentalist in the field of electricity, inventor of a number of important electrical devices, and the formulator of the principles on which Morse later perfected the mechanism of telegraphy. The adoption by the International Electrical Convention of the henry, along with the ampere, the volt, the ohm and the farad, indicates the place that this Nineteenth Century American holds in the world of physics today.

Meantime two Englishmen, two Germans, an Italian and a Russian — Davy, Dalton, Wöhler, Liebig, Avogadro and Mendelyeev — played the important rôles in the advance of the young science of chemistry, particularly in the isolation of elements, the determination of their atomic weights, the establishment of the meaning of atoms, molecules, valences, radicals and chemical formulae, and in the phenomenal rise of organic chemistry. But the effects of pressure, temperature, light, electricity and motion upon chemical change — effects of much greater import for chemistry than the developments just mentioned — could hardly be ascertained until the physical processes were themselves clearly understood.

General or inorganic chemistry remained undeveloped until after the middle of the Nineteenth Century, when it received a basis for advance in the conservation of energy and the electromagnetic theories which were enunciated and established through the work of a group of brilliant Englishmen and Germans — Joule, Kelvin, Mayer, Helmholtz, Faraday and Maxwell.

It was at this point that America's greatest contributions to recent physical science began, with Josiah Willard Gibbs (1839–1903), mathematician, physicist and chemist, who has rightly been called the Newton of chemistry. He was born in New Haven, graduated from Yale, went to France and Germany for advanced study, and then returned to Yale where he held the chair of mathematical physics for the rest of his life. His two notable books, "The Equilibrium of Heterogeneous Substances," and "An Elementary Treatise on Statistical Mechanics," were published between 1875 and 1880, and he also contributed to the subject of vector analysis and applied the results to crystallography, to the theory of light, and to the closer computation of the movements of the heavenly bodies. Building upon the physical principles worked out by his predecessors, Gibbs, with his penetrating insight into the mathematics and physics of chemical processes, cleared away the obscurities and perplexities hampering progress in general chemistry, and laid the foundations for further constructive advance. His high attainments have only recently come to be fully understood and appreciated, though his work was recognized abroad before it was recognized here.

A NOTABLE contemporary worker with Gibbs in the United States was H. A. Rowland (1848–1901), whose improvement in spectroscopic method, through the contribution of his concave reflecting grating, enabled the chemist to penetrate more deeply into the structure of the atom. He also contributed extensively to the study of heat, electricity and magnetism.

While the principles of general chemistry were thus being formulated by Gibbs, and investigations into atomic structure were holding the attention of many scientists both at home and abroad, another group was pioneering in the study of the ether. Two American physicists, Michelson and Morley, achieved amazing results in the interferometer experiments which led to an almost complete overthrow of accepted ideas in physics, and to the revolutionary hypotheses of Einstein. Equally important have been American contributions to physical advance in very recent years, as, for example, Professor Millikan's measurement of the electron and Professor Theodore Richards' researches into atomic weights. The work of American physical scientists has become second only to the discoveries by Europeans of the x-ray, radio-activity and the electron, and the launching of the theories of Einstein and Planck. (*Continued on page 254*)

BUSINESS DISCOVERS HEALTH

Commerce Employs Science to Aid Public Well-Being

By James A. Tobey

AMONG the pernicious attitudes of the past was the reactionary idea that a reputable professional worker was tainted by any commercial connection, no matter how ethical the business might be. Such a sordid association was once considered degrading, debasing, and a descent to Avernus. As a matter of fact, this Avernian decline is not only arrested, but is frequently reversed when business captures the scientist. The odium formerly attached to the professional man in industry has been largely dispelled because many eminent scientists, including some of the former critics of the relationship, have become voluntarily united with commerce. Such arrangements are obviously of mutual advantage to ethical business, to the professional man himself, and to the public.

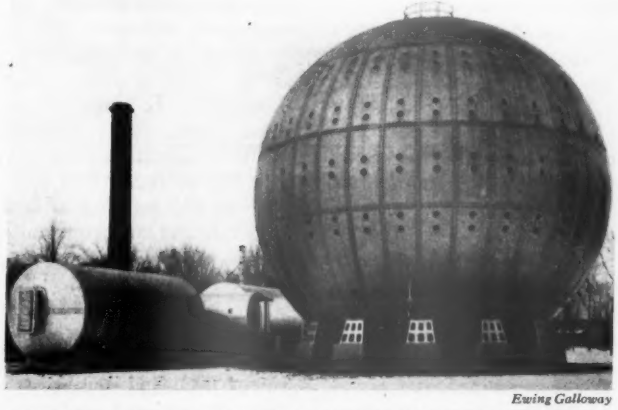
Modern business needs and desires scientific ideals. When technical direction and advice are required, it wants such service. Getting good counsel and using it means that both producer and consumer will benefit. Strange as it has seemed to the more retrogressive of the critics of scientists in business, profits and public service are by no means incompatible, but both are enhanced when professional persons lend their skill and their ideals to commercial pursuits. This fact has been well demonstrated in the field of public health. When an eminent health worker becomes associated with an industry having a product or a process of real significance to national vitality, as so many have, the change is usually not a cause for complaint, but for celebration.

The adequate and reasonable promotion of the public health is always good business, whether performed by the accredited health authorities, indulged in by voluntary health associations with paid executives and workers, or undertaken by business organizations which incidentally profit from ethical and proper health activities. If the people as a whole are actually benefited and not exploited or harmed, such endeavors are worth while for all concerned.

No one would claim, of course, that all business groups religiously refrain from exploitation of their own products in their own interests. But, then, business is not the only agency which can be accused of mercenary tendencies. Recently the New York Academy of Medicine charged that commercialism was rife among the followers of Æsculapius in that metropolis, citing such "glaring abuses" as overcharging, unnecessary operations, publicity seeking, and fee-splitting, in a report drafted by thirty-six of the most distinguished members of the local medical profession. "It is regretted," says this cogent report, "that in many instances physicians are willing to place greater financial rewards on a higher plane than their professional standards." The same indictment can be brought against the ambulance-chasing and litigation-stimulating lawyer, and even the engineering profession possesses mercenary members. There are shysters in science and in the professions as well as elsewhere.

Modern business has, in general, as high standards of ethics as have the best representatives of the acknowledged professions. The ideals are more adaptable to trade, but in every so-called big business, altruism, humanitarianism, and an honest desire to be of service in the most effective and honorable manner are invariable characteristics. This policy is also undeniably good business, and it pays returns on the investment. An example of a valuable endeavor in the health field will demonstrate this fact.

TWENTY years ago a leading life insurance company established a Welfare Division to cope with unnecessary sickness and premature deaths among its industrial policy-holders. This division began a health educational campaign in the creditable endeavor to reduce the mortality among its policy-holders, which in 1911 was several points higher than in the general population. During the next two decades, this company spent about seven million dollars for this purpose, as well as some three times as much money for curative aid to its constituents. Was it worth while? The answer is categorically in the affirmative. Between 1912 and 1926 there were 417,628 fewer deaths among the industrial policy-holders of this company in the United States and Canada than if the 1911 rate had prevailed, and there were 63,330 fewer deaths in 1926 alone. In dollars and cents this decrease meant a saving of $71,500,000 in death claims. Compared with the mortality of the general population, the saving was more than $53,000,000.



Ewing Galloway

SANITARIUM FOR OXYGEN TREATMENT BUILT IN CLEVELAND BY H. H. TIMKIN, AFTER SUCCESSFUL EXPERIMENTS BY DR. O. J. CUNNINGHAM OF THE UNIVERSITY OF KANSAS. PATIENTS LIVE IN THE SPHERE UNDER A PRESSURE OF FIVE TO THIRTY POUNDS ABOVE NORMAL

It is obvious that the $26,864,615.47 for welfare and curative aid had been profitably spent. Other companies have obtained similar results.

Life insurance companies have been among the leaders in the commercial phases of health work. The Metropolitan Life Insurance Company of New York and the John Hancock Mutual Life Insurance Company of Boston have been and are especially prominent in this field. They distribute innumerable authoritative pamphlets, prepare and send out health films, provide lecturers and exhibits, finance research, and supply efficient nursing services. These companies are ably and conscienciously directed in such endeavors and by their efforts have made many real contributions to our public health program.

Although the life insurance companies were among the pioneers in commercial health work, today they perform only a fraction of the many activities of this nature. Food concerns, soap and tooth paste manufacturers, and other industrial groups are zealously undertaking popular health instruction of a high order, sometimes as the responsibility of a single concern, but often through an agency representing and supported by the whole industry. Two of the most noteworthy of these quasi-commercial organizations are the National Dairy Council, Chicago, established in 1919, and the Cleanliness Institute, New York, created by the soap manufacturers some two years ago. These agencies are meticulous in securing the advice and assistance of leading scientists, and their material is authentic, valuable, and usually much more satisfactory than that which emanates from official or voluntary health groups.

In a recent health inventory of New York City, conducted under the auspices of the Welfare Council of that community, the statement is made that "most agencies use publications of commercial firms, and a number prefer them to other literature, as they are usually more attractive and therefore more popular." This report, however, bewails the fact that more concerns do not coöperate with social welfare agencies, or vice versa, in the preparation and distribution of such material. This is a sign of the changing attitudes. At one time, no health group would demean itself by using commercial health literature, but now sanitarians realize that business is going to issue health material anyway, that it usually has better channels of distribution and advertising than other groups, and that it has the confidence of the public, and so the logical procedure is to coöperate with business so as to assist and guide it in producing and putting out material which is useful, scientific, and moderate. Business welcomes this kind of coöperation.

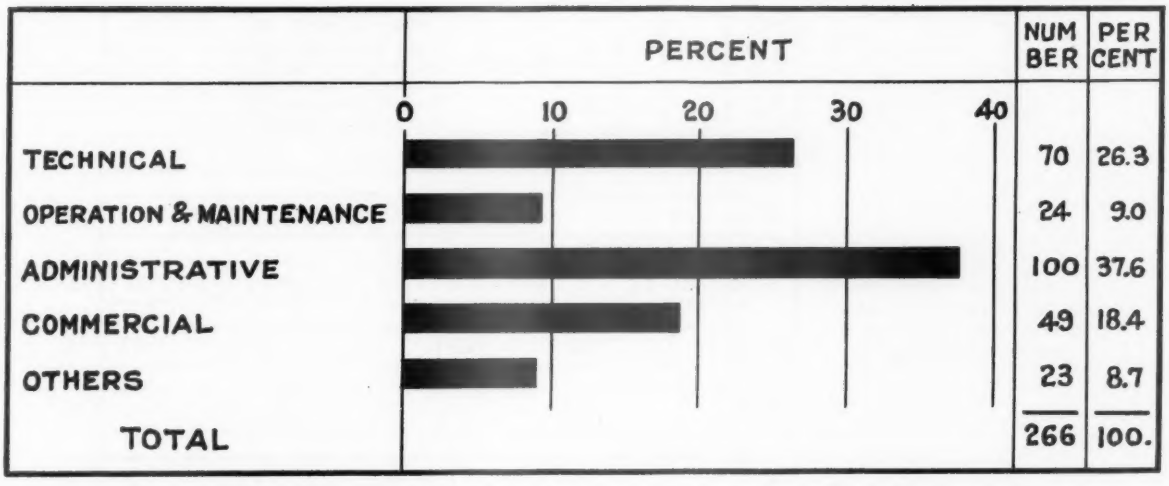
The magnitude of industrial operations in the health field is revealed by the estimate of a reliable observer, a former social worker who now directs the destinies of a trade association, that business spends half a million dollars a day on employee health and social service, and an equal amount on educational activities pertaining to health. Three hundred million dollars a year is a sizable lump in the economic affairs of the nation. It is, in fact, about four times as much as the combined budgets of our federal, state, and municipal health departments. Leaving out of account industrial medicine and hygiene, which is good business in any factory, office, or store, commercial health education is a large item.

Among the many organizations which have something to contribute in the way of decent health propaganda are the American Institute of Baking (Chicago) and the National Food Bureau (Wichita, Kan.) for the bakers, the American Institute of Meat Packers (Chicago), the American Dry Milk Institute (Chicago), the Evaporated Milk Association (Chicago), the National Association of Ice Cream Manufacturers (Harrisburg, Penna.), the National Cheese Institute (Milwaukee), the National Confectioners' Association (Chicago), the California Fruit Growers Exchange (Los Angeles), and such individual concerns as Borden, Colgate, Cream of Wheat, Frigidaire, Kellogg, Postum, Quaker Oats, Squibb, and United Fruit, to mention only a few. Capital and labor are alike interested in public health, as the Chamber of Commerce of the United States (Washington, D. C.) has a well-developed health program, with technical advice from the American Public Health Association, and there is a Worker's Health Bureau (New York).

NOT every individual business firm or trade association is pure and unsullied in its so-called health activities. The prosperity of a particular business or product is sometimes of far greater concern than the general welfare of the public. Recently we have had a discreditable exhibition of unethical advertising by cigarette manufacturers who have been trying to delude the public into believing that this form of tobacco can contribute to lissome slenderness, or can soothe throats, or calm nerves, all of which is bunk, and the people know it is. Paid testimonials only aggravate this offense, and have brought down on the offenders the wrath of the Federal Trade Commission.

The public is sometimes bewildered in trying to distinguish between rank propaganda and helpful advice. Extravagant claims are made for this or that product and when several such assertions clash, the public wonders which is correct and often decides that none is. It is often a nice question as to what is propaganda, in the iniquitous sense, this inquiry frequently arising in connection with foods. Ardent advice to drink milk and to eat more green leafy vegetables and fruits may be entirely unobjectionable, since all progressive scientists are agreed that pure milk is the most valuable of all human foods, and that milk, fruit and certain vegetables are essential protective foods. What boundaries are, however, to be placed on propaganda for coffee, cereals, sugar, meat, candy, and numerous other edible commodities, the dietary use of which can be beneficial, but may also be abused?

If the organization or firm advocating the product is moderate and not exuberant in its recommendations, and fits the substance into its proper place in a well-balanced diet, all well and good. If, for example, the coffee growers engage the services of a reputable scientist and give him carte blanche to make an impartial investigation of that aromatic beverage, and in due course of time, after investigation and deliberation, he reports that when properly prepared, and used in moderation, good coffee will not harm normal, average adult individuals, the coffee interests are not to be blamed or considered criminals if they broadcast that (*Continued on page 256*)



OCCUPATIONAL CLASSIFICATION OF 266 ELECTRICAL ENGINEERS MORE THAN SEVEN YEARS OUT OF COLLEGE

WHAT ENGINEERS BECOME

Is Executive Leadership To Be Anticipated by Technical School Graduates?

By Erwin H. Schell

RECENTLY I have had occasion to examine the literature of the last few years which relates to the engineer in the field of management. While the survey left much to be discovered, one fact was definitely established. The recent past has indeed been the open season for after-dinner addresses on this topic. Apparently when the hard-working secretary of the national organization undertakes the preparation of the convention program his telephone conversation with the Drawing Card runs something like this:

"We would indeed be honored if you would be willing to address our convention at the closing banquet on June 11."

"What do you want me to talk about?"

"Our committee felt that 'Religion in Business' would be an excellent topic."

"Rather not, just at this time."

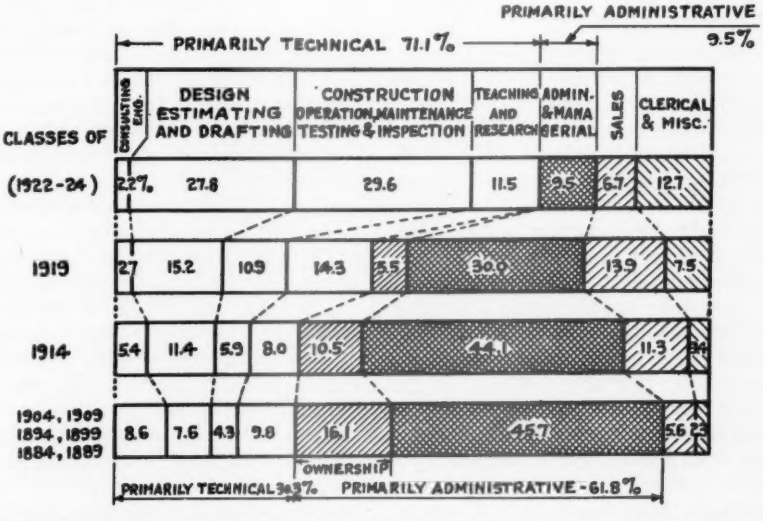
"How about 'The Industrial Outlook?'"

"Out of the question, my secretary is away."

"Perhaps 'The Engineer as a Leader' would do?"

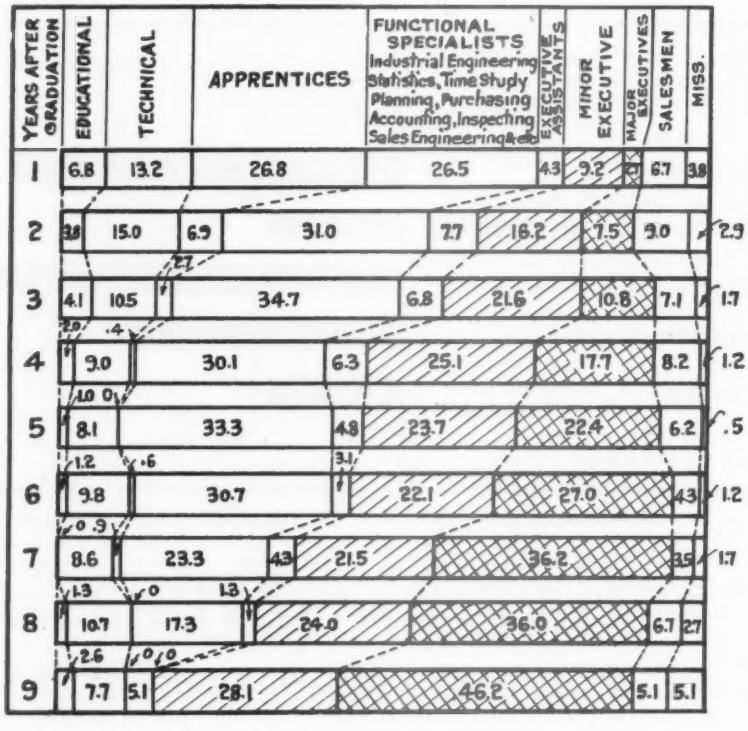
"I have a few ideas on that, glad to talk extemporaneously."

Against this barrage of opinion, advice, and prediction two publications stand in fine contrast. The Society for the Promotion of Engineering Education published in 1926 two occupational studies of engineering graduates. One investigation had to do with the records of 844 electrical engineering graduates (Bulletin Number 8); the other with something over 6,000 graduates of engineering schools (Bulletin Number 3). Here are objective data which are accurate and dependable.



PROGRESSIVE TREND OF ENGINEERING GRADUATES TO MANAGERIAL DUTIES AS REVEALED BY A STUDY OF OVER 6,000 GRADUATES OF ENGINEERING SCHOOLS

To compress the findings of these two researches is to distort them unfairly. The complete reports are worthy of study by any engineer who is interested in the trend of his profession or who wishes wisely to guide those of engineering talent younger than he. Certain


YEARS AFTER GRADUATION
EDUCATIONAL
TECHNICAL
APPRENTICES
FUNCTIONAL SPECIALISTS
Industrial Engineering
Statistics, Time Study
Planning, Purchasing
Accounting, Inspecting
Sales Engineering &c
EXECUTIVE ASSISTANTS
MINOR EXECUTIVE
MAJOR EXECUTIVES
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OCCUPATIONAL DISTRIBUTION OF 334 GRADUATES IN ENGINEERING ADMINISTRATION (COURSE XV) AT M. I. T.

statements concerning the findings can be made, however.

In the study of electrical engineering graduates a group of 266 men were found to be graduates of more than seven years' standing. A classification of these men in terms of occupations is shown at the top of the preceding page. It is clear that those in administrative work are in larger number than those combined in technical, operation, and maintenance activities. Younger graduates, on the other hand, are shown by the report to lay greater emphasis upon technical activities — a logical condition as executive leadership in any field should be built upon an earlier proficiency in some aspect of the art or science which will command the respect of the led.

An even more illuminating picture is presented in the second mentioned investigation where the progressive trend of engineering graduates to managerial duties is presented in chart form at the bottom of the preceding page. Here, we can visualize the vocational current flow of over 6,000 engineers, and we can see the swing from primarily technical activities into those which are primarily administrative. It should further be clear that this transition is not an abrupt one. Engineers do not have to leave the engineering field in order to become managers. Indeed, our greatest manufacturing industries with their vast investments in highly complex machinery and other equipment, and the increasing technicality of their products, are essentially the natural habitat of the engineer. He is a native of these lands, he speaks the language and is free from the confidence-destroying, inner fear that comes with ignorance of fundamentals.

A somewhat similar picture results from a study of occupational trends among 334 graduates of the Course in Engineering Administration given at Technology. (See above.) The greater emphasis given in this course to subjects of an economic and industrial nature probably accounts for the wider diversity of initial occupations undertaken by graduates. The trend from apprentice to functional specialist and thence to minor and major executive posts is obvious, although the distinction between the last two groups is overemphasized. The so-called major executives frequently hold such positions in small or medium sized concerns while the minor executives though of lesser title carry equal weight of executive responsibility in larger organizations. The early appearance of major executives in the chart is accounted for by the presence of older men of previous business experience who, after graduation, were enabled quickly to capitalize their scholastic and industrial background.

The unfortunate inference that executive positions are superior to others, may accompany the showing of such charts as these. Executive ability is only one of many varieties of industrial virtue. Indeed, it is an axiom of the good executive that his coördinating and interpretive responsibilities should extend themselves over men who are avowedly his superiors in many things.

The true story of these charts would seem to be that in this rapidly evolving life of ours such personal resources as an ability to think with precision, a facility in turning the forces of Nature to human account, a zest for inquiry, an eagerness for the new and better, and humility before the truth, are daily become more precious to the world's welfare. That they may be more widely practised, technical school graduates increasingly are being placed in positions where their examples may stimulate and influence the work of others. Whatever may be the reasons, there is no question but that management has become an important responsibility of the engineer.

THE TREND OF AFFAIRS

Carbon Monoxide Conquered?

SOLUTION of the problem of overcoming the dangers of carbon monoxide gas which pours from the exhaust of every automobile may be hoped for in the studies of Dr. J. C. Frazer of Johns Hopkins University, who announces a process which converts carbon monoxide into carbon dioxide, the harmless gas of soda water.

The lethal effects of carbon monoxide, the colorless, tasteless, and invisible gas, which has caused the deaths of hundreds of motorists, are not alone confined to the operation of automobile engines in closed garages. A far greater problem, and one which is attracting increasing attention, is contamination of the atmosphere by the gas from thousands of automobiles.

Although tests made in large American cities have shown that the amount of carbon monoxide in the air is well below the fatal limit, some health authorities are considering the possibility of slow chronic poisoning among those, who, living in our large cities, continually breathe air contaminated by automobile exhaust gases.

The United States Bureau of Mines has found in a series of careful tests that gases from an automobile motor may contain as much as 14% carbon monoxide. The average amount is estimated to be about 7%, which would bring death in a small closed garage in less than ten minutes. As small an amount as one-hundredth of one per cent of carbon dioxide has been found to be dangerous, and one per cent may be a lethal dose.

Dr. Frazer's device, which has already had exhaustive laboratory and service tests, employs chemical catalysis as its method for converting a deadly gas into carbon dioxide, a most healthful one. He has not yet made public the name of the catalytic agent by which this conversion is brought about, but the announcement of his process indicates that it has been proved successful beyond the merely experimental stages, and that only mechanical means of applying it remain to be perfected. That any method for eliminating the dangers of carbon dioxide would be considered a major development in the protection of the public health is indicated by the great interest of public health officials and the automobile industry in the possibilities of Dr. Frazer's process.

Windowless Buildings

ARCHITECTURAL critics have criticized the modern building for being more of a machine than a house. "A modern building," complains Lewis Mumford in his notable book of architectural criticism, "Sticks and Stones," "is an establishment devoted to the manufacture of light, the circulation of air, the maintenance of a uniform temperature, and the vertical transportation of its occupants . . . the habit of punching windows in the walls of the building-machine is responsible for great leakages . . . the maximum efficiency demands the elimination of windows."

Claims for a new daylight lamp developed conjunctively by the General Electric Company and the National Lamp Works forecast the advent of these windowless structures which Mr. Mumford holds to be a logical end to the continued defilement of architecture by engineering. This new "Sunlight Lamp, type S-1" will not only give light for visual purposes, according to Dr. M. Luckeish of Nela Park, but from it will emanate synthetic, health-giving sunlight with all its powerful rays.

In describing this light-source which simulates the sun, Dr. Luckeish says: "A tungsten filament operates in parallel with a mercury arc between tungsten electrodes. The hot filament near a pool of mercury vaporizes the latter and the arc is completed almost instantly after the switch is on."

The use of this light, should it be perfected, would make windows unnecessary, even windows designed to transmit ultraviolet. A building using these lights might be a completely enclosed unit free from sound- and heat-conducting openings. Occupants could not see out, but what is there to see from the windows of a city building?

A deplorable situation, Mr. Mumford might justifiably remark, brought about by lack of town planning!

P. & A.

NEW LOCOMOTIVE JUST COMPLETED FOR THE LONDON AND NORTH EASTERN RAILWAYS. IT OPERATES UNDER 450 POUNDS PRESSURE AND WEIGHS 170 TONS

Welded Buildings

BOSTON'S name is now added to the roll of larger cities which have tried, or are trying, the application of electric arc welding to structural work. The 14-story steel frame building which the Edison Company is putting up on Tremont Street, near the Boylston Street corner, is the initial local venture, or adventure, in erecting such a building without the discords of pneumatic riveting hammers. It is being built under the advice of Professor Frank P. McKibben, '94, of Union College, a recognized authority on electric welding.

(*Continued on page 244*)

Engineering Contributions to Civic Beauty

Two views of the new Cleveland Passenger Terminal, the estimated finished cost of which is to be $60,000,000. It required the rerouting of the passenger trains of the New York Central for twenty miles, of the Big Four trains for twelve miles, and of the Nickel Plate trains for four miles. The Terminal is four miles in length, consisting of a station area covering some thirty-five acres. The thirty-four station tracks are, of course, electrified

The Terminal development will radically change the downtown section of Cleveland, substituting modern buildings for old, and providing new thoroughfares for traffic. It is a fine example of civic enterprise governed by a sense of beauty and dignity as well as utility

Henry D. Jouett, '00, is chief engineer

Photographs by Margaret Bourke-White

Wide World

LAUNCHING AT PORTSMOUTH, N. H., OF THE "V-5," AMERICA'S LARGEST SUBMARINE

There is really nothing particularly new about welded buildings — two years ago 43 of them existed in this country — but the rapidity with which the employment of this method is spreading is worthy of more than casual mention. In the space of a year the number of welded buildings increased 50% and the number of welded structures of notable dimensions such as bridges, cars, cranes, frames, towers, ships, and tanks, was 138 up to last summer, according to Professor McKibben's estimates.

Tests and experience have demonstrated that welding can be undertaken "with complete safety and with entirely satisfactory results." This has resulted in the Commonwealth of Pennsylvania legislating to permit its use in first-class cities, municipalities below that grade already being free to adopt their own codes. Also the uniform code of the Pacific Coast Building Officials Conference, including a section on welding, has already been adopted by 40 towns and cities, and model ordinances framed by the American Welding Society have found favor. Pittsfield, Mass., was the first to adopt them formally, and incidentally, Pittsfield is credited with being the first truly eastern city to incorporate welding in any form in its building code.

The possibility of welding as an agency to assist in approaching the goal sought by New York's Noise Abatement Commission, whose studies were commented upon in The Review last month, is apparent. About one-fifth of urban noise is charged against excavation and building machinery to which riveting hammers contribute a major portion. What it means to eliminate them was strikingly illustrated by extensions made last year by welding methods to a hotel in Atlantic City, quickly and quietly, without disturbing the guests or neighbors. The addition has a height of 134 feet which makes it one of the tallest welded-steel buildings in the world, and some of the steel columns supporting the structure and its heavy contents are of the heaviest type of steel shapes used in construction.

Besides reducing the noise incident to construction, the welding process introduces means for reducing the weight of a structure. This equally desirable factor was emphasized by a new type of arc-welded steel floor demonstrated at the last convention of the American Institute of Steel Construction. It is known as the "battledeck" type and it utilizes steel plates and structural steel beams, a special automatic arc-welding machine being used to "stitch" the plates and beams together. Its cost is said to be not at all prohibitive; it is suitable for residences, multiple-story buildings, ship decks, and bridges; it might possibly save in dead weight from 20 to 60 pounds per square foot of floor, thus permitting an increase of 25% or more in the height of a tall building without increasing the load on the foundations.

Naturally the general use of structural welding will come slowly. The necessity of turning riveters into welders, of bringing designers to work in terms of welded joints, and of familiarizing contractors with the technique of welding construction means that probably ten years will elapse before the method gains widespread use.

Progress in Physics

FOR all who are unable to enter the recondite abode of the Modern Physicist, there remains the consoling possibility of deriving philosophical subtance from the crumbs dropped at the doorway. Such sustenance may be found in the following comments on Professor A. J.

208,000-K.W., 3-UNIT TURBINE-GENERATOR SET BUILT BY THE GENERAL ELECTRIC COMPANY FOR THE STATE LINE GENERATING COMPANY, HAMMOND, IND.

Dempster's (University of Chicago) experimental demonstration of the wave nature of matter which won the award given by the American Association for the Advancement of Science for the most noteworthy contribution to science during 1929:

ARTHUR H. COMPTON, Nobel Prize winner for Physics in 1927 — "The most important contribution of Twentieth Century physics has been the discovery that the physical world is composed of three kinds of particles: protons, electrons, and photons, and that each of these particles has also the characteristics of waves.

"The last stage of this work is the proof that protons, the positively charged parts of matter, have wave characteristics. It is this completion of the great work of Twentieth Century experimental physics which has now been achieved through Dempster's discovery of the diffraction of protons by crystal."

HENRY G. HALE, Head of the Department of Physics, University of Chicago — "Physicists seeking to explain the ultimate nature of things have believed that light was simply a wave form and that atoms, which consist of negative electrons around a positive nucleus or proton, were simply particles.

"Professor Compton in 1926 proved that light is not only a wave but a stream of particles, or photons, bundles of radiant energy. In 1927, two investigators at the Bell Laboratories, Davission and Germar, revealed that negative electrons are not only particles, but that each particle acts as a wave.

"The final evidence in the cycle has now been adduced by Dr. Dempster, who has proved that positive protons have also a wave form as well as particle form. These three discoveries are probably the most striking advances in physics in recent years."

Professor Dempster achieved his proof by photographing the behavior of a hydrogen atom through a calcite crystal and registering the waves on a plate. He explained the diffraction of protons by the crystal as being similar to the diffused appearance of sunlight through an umbrella, a phenomenon peculiar to things having a wave form.

"In these experiments, a calcite crystal takes the place of the umbrella and is used as a mesh to control the particles," he said. "The hydrogen protons in these experiments penetrated the crystal in much the same way that light protons would, and their patterns on the photographic plate leave no doubt as to their wave properties.

"How protons, electrons, and photons can be both waves and particles at the same time is perhaps the greatest problem now confronting physicists. This experiment does not throw direct light upon that obscure relationship, but helps to clarify the problem."

PORTABLE HELIUM REPURIFICATION PLANT DESIGNED BY THE HELIUM COMPANY OF LOUISVILLE, KY., FOR THE GOODYEAR-ZEPPELIN CORPORATION. IT CAN BE PLACED BESIDE THE AIRSHIP AND CAN REMOVE THE IMPURE HELIUM FROM THE BAG, REPLACING IT PURIFIED IN A SINGLE OPERATION. LOSS OF GAS BY THIS METHOD OF CLEANING IS ONLY ONE PER CENT. HITHERTO IT HAS BEEN NECESSARY TO SHIP THE HELIUM BACK TO THE PLANT FOR REPURIFICATION

Safer Subs

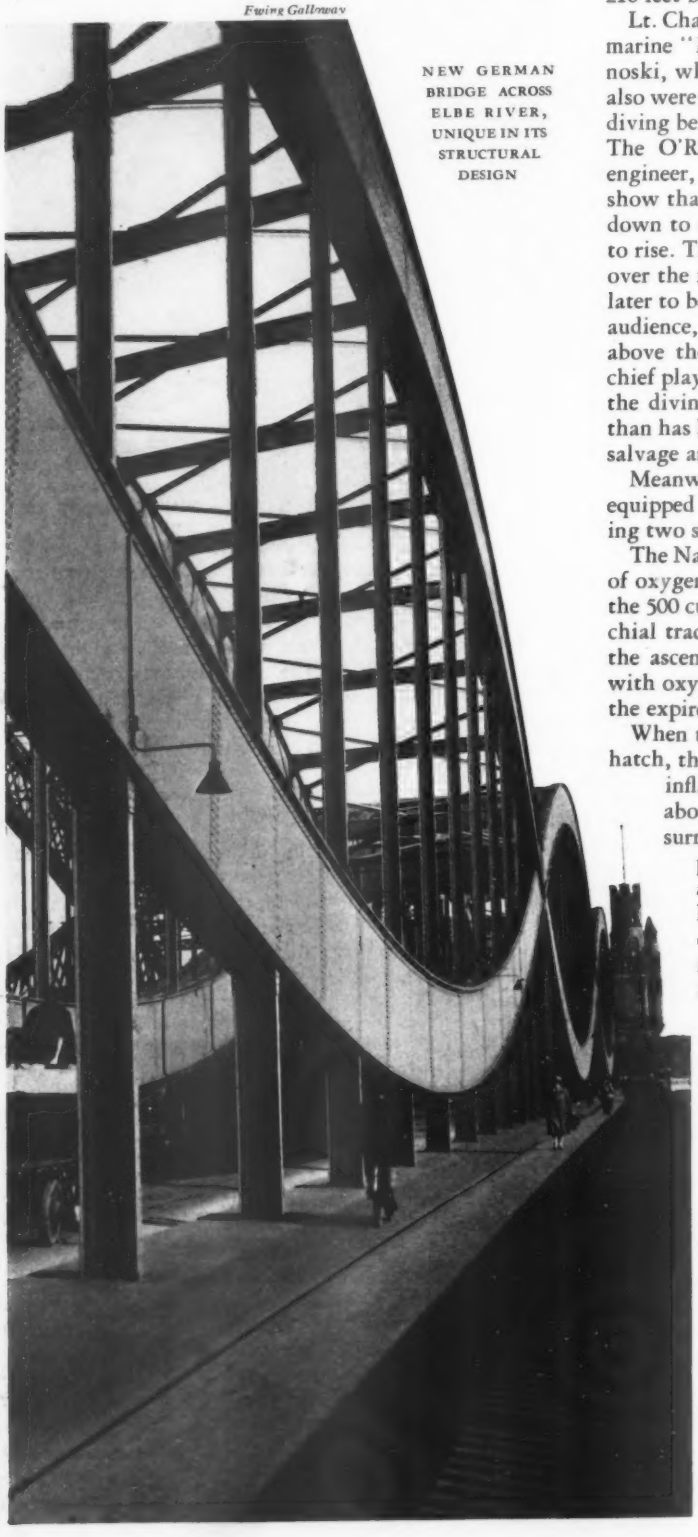
DESPITE the fact that the Naval Conference in London has considered the question of abolishing the submarine as a weapon of warfare, the United States Navy is carrying on experiments in the warm clear waters off the coast of Florida to make the under-water marauder safer for its crews, and, as a consequence, more dangerous to the enemy.

Underwood & Underwood

LEFT: VIEW OF NEW SAFETY-EQUIPPED "S-29," SHOWING THE "PAD-EYES" NEAR THE WATER'S EDGE TO WHICH CABLES MIGHT BE ATTACHED SHOULD THE SUBMARINE SINK. RIGHT: DEMONSTRATION OF THE MOMSEN LUNG USED IN ESCAPING FROM THE SAFETY LOCK ON DECK. SEE ABOVE

The hull of the submarine *S-4*, which was the death chamber of forty men when the craft sunk off Cape Cod in 1927, is being used for experiments, and it was in this research ship that Navy men recently demonstrated the value of the submarine "lung" in making their escape from the vessel while she lay on the bed of the ocean 210 feet below the surface.

Ewing Galloway



NEW GERMAN BRIDGE ACROSS ELBE RIVER, UNIQUE IN ITS STRUCTURAL DESIGN

Lt. Charles H. Momsen, one of the inventors of the submarine "lung," and Chief Torpedoman Edward A. Kalsnoski, who were the first to try the mechanical "lung," also were the first on January 29, to descend in a new type diving bell and enter the submarine at a depth of 68 feet. The O'Rourke diving bell, invented by a Brooklyn engineer, was employed by Momsen and Kalsnoski to show that such a device might be useful in sending men down to enter and make repairs in a submersible unable to rise. They descended in the bell, which was made fast over the motor hatch of the *S-4*, and entered the vessel, later to be "rescued" in a grim little drama in which the audience, waiting on the deck of the U.S.S. *Falcon*, far above the darkened stage, could only guess what the chief players were doing. It is the hope of the Navy that the diving bell may be employed at far greater depths than has been possible by any other method in submarine salvage and rescue operations.

Meanwhile, all United States submarines are being equipped with the artificial lungs, each of the crew having two such devices at his disposal in case of disaster.

The Navy's mechanical "lung" does not carry a supply of oxygen, but makes use of the air that is contained in the 500 cubic centimeters of the wearer's lungs and bronchial tract. Under that pressure, there is enough air for the ascent. The breathing bag, moreover, is also filled with oxygen just before use. Soda lime is used to absorb the expired carbon dioxide.

When the man emerges from the escape lock or escape hatch, the breathing bag of the apparatus after its initial inflation, contains air or oxygen at a pressure of about one-half pound in excess of the pressure of the surrounding water. As the man ascends and the pressure of the surrounding water decreases, the air within the breathing bag tends to expand. Instead, however, of causing an over-inflation of the bag, with its consequent greater displacement, the excess air escapes from a vent valve on the bottom of the bag which is so located that it is about 12 inches below the top of the bag or about 18 inches below the wearer's mouth.

The ship's escape lock is a chamber communicating with a compartment by an air-tight hatch. From one to three men can enter, close the hatch and admit water from below. This leaves an air bubble at the top of the lock. A second hatch at the side of the lock allows the men to escape. The lock can be used repeatedly if one man remains in it each time to close the outside hatch, open an air valve to blow out the lock, and then open the hatch to the submarine.

On the Ways

WORLD shipbuilding is proceeding almost at a level with the rate of production just before the Great War and the

activity on this side of the Atlantic has raised the United States from seventh to fifth in a year. Lloyd's Register of Shipping, covering returns from all maritime countries, places the volume under construction during the last quarter of 1929 at 3,110,000 tons or only 8,000 tons under the 1927 figure which was the largest since the war-boom. The current aggregate includes 1,560,254 tons for the United Kingdom, 253,256 for Germany, 231,934 for Holland, 183,570 for Japan, and 179,062 for the United States. In the last quarter of 1928 world construction was 2,618,000 tons, of which 1,243,000 were British and but 48,000 American.

A revolutionary change in mercantile marine was foreshadowed by the appearance, in 1910, of the first ocean-going motorship, that is of a vessel driven by internal combustion engines. Motorship construction now represents about 56% of the present world production. It comprises 90% of the tonnage being built by Japan, Denmark, and Sweden; 80% of that by Russia and Holland; slightly less than half of the British total, and a quarter of the American. The *Britannia*, launched last August by the White Star Line, is 680 feet long with a tonnage of 27,840. She is the largest British-built motorship, being exceeded in size only by the Italian *Augustus* (33,650 tons), the largest motorship afloat.

While the first cost of a motorship exceeds that of a steam-driven vessel, the operating wage item is less, handling oil aboard ship is much less costly than handling coal, there is an increase in the dead weight available for cargo (due principally to the reduction in the weight of the fuel carried), and there is also an increase in the capacity of the space available for cargo because oil can be stored in odd-shaped bunkers such as between the outer and inner hulls. But motorships, despite any inference derivable from the great increase in their world tonnage, cannot compete with steamships on short runs.

Lloyd's figures disclose that the shipyards of Great Britain and Ireland, which in the years 1905–1913 built nearly two-thirds of the world's ships, are still building more than all other countries combined but now hold this position by a very narrow margin. Forty per cent of their business now comes from overseas, 10% from the Dominions, and 30% from elsewhere.

Oil tankers account for about a fifth of the present world tonnage and, while this is in the nature of a boom (without which Lloyd's figures might have indicated a severe shipbuilding slump, particularly in British yards), the development of this

Ewing Galloway

LOOKING UP THE SIDE OF THE ITALIAN STEAMER, "CONTE BIANCAMANO"

highly specialized transport service is shown by the fact that the world's oil tanker fleet has increased nearly five-fold since 1914. This has been due to an increase in the same period, from 1,310,210 to 19,421,000 in the tonnage of steamships fitted for burning oil and from 234,287 to 6,628,100 in the tonnage of motorships. The oil industry is now directly concerned in about a fifth of the mercantile marine of the world, and its interest in the world's navies is, of course, much greater. It should be pointed out, however, that the life of oil tankers is short, necessitating many replacements.

Last year was the best for American shipbuilders since the War. During 1929, 54 yards delivered 554 merchant vessels having a gross tonnage of 284,226, an increase of 22.3% over 1928. American tonnage now under construction is estimated to be 244% above that on order at the beginning of 1929. In a consolidated report from 48 shipyards it appears that 215 merchant vessels totalling 359,460 tons are building. Also plans for 51 vessels are reported to have been, or are being, prepared for building to carry mails under the new contracts to be granted by the Post Office Department, and 120 other ships for coastwise, intercoastal, or harbor service are planned.

Wide World

LT. APOLLO SOUCEK PREPARING TO TEST A NEW OUTFIT FOR ALTITUDE FLYING, PREPARATORY TO HIS ATTEMPT TO RECAPTURE FROM GERMANY THE ALTITUDE RECORD

THE provisions of the Jones-White Law, enacted in 1928, are responsible, not only for the 51 projected vessels mentioned above, but for the hopeful feeling that America may again become ship-minded, even though a majority of its population is removed from tide water. A century ago nine-tenths of our foreign trade went in American bottoms, in 1910 less than a tenth, today about three-tenths. The desire to restore the prestige which obtained during the "clipper ship era" has been prevalent, especially since the War, but obstacles, growing out of our protective tariff, in the way of building in the United States and of operating under American registry have seemed quite inhibitory.

Cost of building in British yards, for example, is less than half what it is in the United States; higher wages make the labor item for the operation of American ships double that under the British and three times that under the French flag; it has been difficult to borrow from the Government to finance construction and hitherto mail contracts have been awarded from year to year. The liquidation of war-built boats by the Shipping Board and its excursion into operating passenger and freight services introduced ruinous competition. This fostered foreign propaganda which was already encouraging doubts that the American people were "ship-minded" and hence had better avoid a large merchant marine.

Now under the Jones-White Law, a builder can borrow three quarters of the capital cost of his ship at the same rate of interest as is paid by the Government, and the loan period may extend over twenty years. The act also makes it easier for the Shipping Board to sell its vessels to private owners and provides a means to bring about the ultimate elimination of the Government as an operating factor.

By allowing mail contracts to be made for ten-year periods, and by authorizing a higher rate of pay for carrying mail, an inducement is offered to compensate for the higher construction costs and the higher expense of operation as compared with vessels under foreign registry. Now, too, the holder of a mail contract can know better where he stands for he will not have to face annually the possible non-renewal of one of his important sources of revenue. Moreover, the rate per pound per mile is based on a sliding scale depending on the ship's speed and a twenty-knot express steamer will get over five times the rate given a ten-knot boat. Thus an owner can afford to undertake the greater risks attendant upon building swifter vessels as well as their increased operating costs.

Tangible results of the Jones-White Law can be seen in 17 vessels now on the ways with combined tonnage of 215,600. Towards their construction the United States is lending $45,641,687. The Ward Line, for instance, is being helped by a loan of $6,450,000, to get two fast passenger liners so as to give 60-hour, instead of 72-hour, service, between New York and Havana. Also, although started before the passage of the act, its benefits will accrue to the Panama Pacific Lines operation of the *California*, *Virginia*, and *Pennsylvania*, which make the 5,600-mile run from New York to the West Coast in thirteen days. All three, incidentally, are turbo-electric driven, that is, propelled by electricity generated by a steam turbine, a means brought to perfection by the American Navy which first tried it in the collier *Jupiter*, now the aircraft carrier *Langley*. Other proposed additions to the American merchant fleet made feasible by the act, excluding two immense liners being prepared for the transatlantic race (*vide infra*), aggregate over 300,000 tons.

LAST SUMMER, when the North German Lloyd's *Bremen* on her maiden voyage averaged 27.83 knots and passed Ambrose Channel Lightship 4 days, 17 hours, and 42 minutes after she left the breakwater at Cherbourg, she wrested the blue ribbon of the Atlantic from Cunard's *Mauretania*, a supremacy of which the latter had boasted for two decades. Later the *Mauretania* almost regained the record and, still later, the *Bremen* made an eastbound passage in 4 days, 14 hours.

The *Bremen's* triumph signalized the comeback of Germany's merchant marine which fell from 5,238,937 tons in July, 1914, to less than 500,000 in July, 1919,

but by July, 1929, had grown again to over 4,000,000. It also bestirred public interest in the race for transatlantic supremacy in speed and size in which five nations are entered. The stakes are nearly $200,000,000; the goal a four-day service with, for advertising purposes largely, steamers 1,000 feet and longer.

The United States Lines, Inc., which operates the *Leviathan* is making plans for two 60,000-ton liners to be 1,000 feet in length and capable of 27½ knots; the White Star Line sometime ago laid down the keel for the *Oceanic* at Belfast, Ireland, and is said to have materially altered her design and increased her length to 1,080 feet upon the appearance of the *Bremen;* the *Cie. General Transatlantique* has announced that it is building at St. Nazaire a super-liner, 3,500 tons heavier and 2½ knots faster than the *Bremen;* Cunard is reported to contemplate two 60,000-tonners capable of 28½ knots with direct drives like the *Mauretania* and *Aquitania;* two proposed Italian sister ships, the *Dante* and *Conte Azurro*, although not to be in the 1,000-foot class, are to be capable of 27 knots and thus cut the running time of the New York-Naples service from nine days to a week. The *Europa*, sister of the *Bremen* and rebuilt after an incendiary fire, is expected to make her maiden westbound crossing this month.

The present challenge for supremacy started by the *Bremen* recalls the struggle at the turn of the century when the North German Lloyd launched successively the *Kronprinz Wilhelm* of 1901, the *Kaiser Wilhelm II* of 1902, and the *Kronprincessin Cecilie* of 1906, the latter the "gold ship" of 1914. Before the *Cecilie* could be tried at her best the British entered the *Lusitania* and the *Mauretania*, affectionately the "Big Lucy" and "Big Mary" in shipping circles. The latter lowered the speed record and was "Queen of the Atlantic" for over twenty years, though the Hamburg American Line answered the Cunarders, beginning in 1912, with the three biggest steamers in the world; then called the *Imperator, Vaterland*, and *Bismarck*, but now renamed respectively the *Berengaria* (Cunard), *Leviathan* (U. S. Lines), and *Majestic* (White Star Line).

The *Bremen*, though longer than the *Berengaria*, *Leviathan* or *Majestic* is surpassed by them in registered tonnage. The *Bremen*, however, has the highest rated horsepower of any passenger vessel afloat. In this respect she bows only to three warships: the airplane carriers, U.S.S. *Saratoga* and U.S.S. *Lexington* (180,000 h.p.) and H.M.S. *Hood* (144,000 h.p.). The *Bremen's* oil burning turbines are rated at 132,000 horsepower and she operates at a boiler pressure of 375 pounds per square inch. In appearance, she does not resemble other liners; her bulbous bow (hitherto used on warships but not on liners), her stubby, elliptical funnels, her obvious design to cut down sea and wind resistance, mark her as unique. She is the first large ship to be welded instead of riveted.

Speed and size capture public fancy and produce capacity business at the peak of the tourist season, but in the lean months the inherent expensiveness of superliners is unmatched by super-income. Roughly speaking fuel consumption varies as the cube of the speed and, though even 33 knots is quite possible (both the *Lexington* and *Saratoga* have averaged nearly 35) it is questionable whether operation at such high speeds, with the attendant excessive wear and tear on the machinery, is commercially feasible. Docking facilities are already cramped at New York and 1,000-foot ships will be a problem there and elsewhere. Their operation through the Panama Canal is impossible and their draft would call for dredging of channels in most seaports.

While the thought of size inspires a feeling of safety, high speeds produce vibration often discomforting to passengers. It is also true that the buffeting of huge liners on the North Atlantic this winter points out that size is no special protection from a storm, in fact it is frequently the reverse when a long ship "rides" two waves. The *Majestic* suffered severe damages in a storm last year, and other big liners had difficulties in the great Atlantic storm last December.

Needed — More Scientists

DR. MAYER, in his article on page 233, demonstrates that America's fertility in science is comparable to that of other nations, but that fact does not diminish the cogency of Professor R. A. Seligman's recent lament on the shortage of scientific brains, not only in America, but in the entire world.

The remarks of this member of Columbia's faculty were made at a dinner marking the completion of the first volume of the Encyclopedia of the Social Sciences, of which he is Editor. This huge enterprise, comparable in the minds of many to the great French encyclopedia of the Eighteenth Century, is being sponsored by ten learned societies.

"We no longer," said he, "have the conditions which created the great scientists of old. We cannot look forward to an Adam Smith in the social sciences, or to a Pasteur in the natural sciences. The head of a great scientific institute asserted the other day that he did not have a single first-class mind among his younger associates; and in the social sciences it has long become a byword that the most brilliant intellects are drafted off into business and the professions.

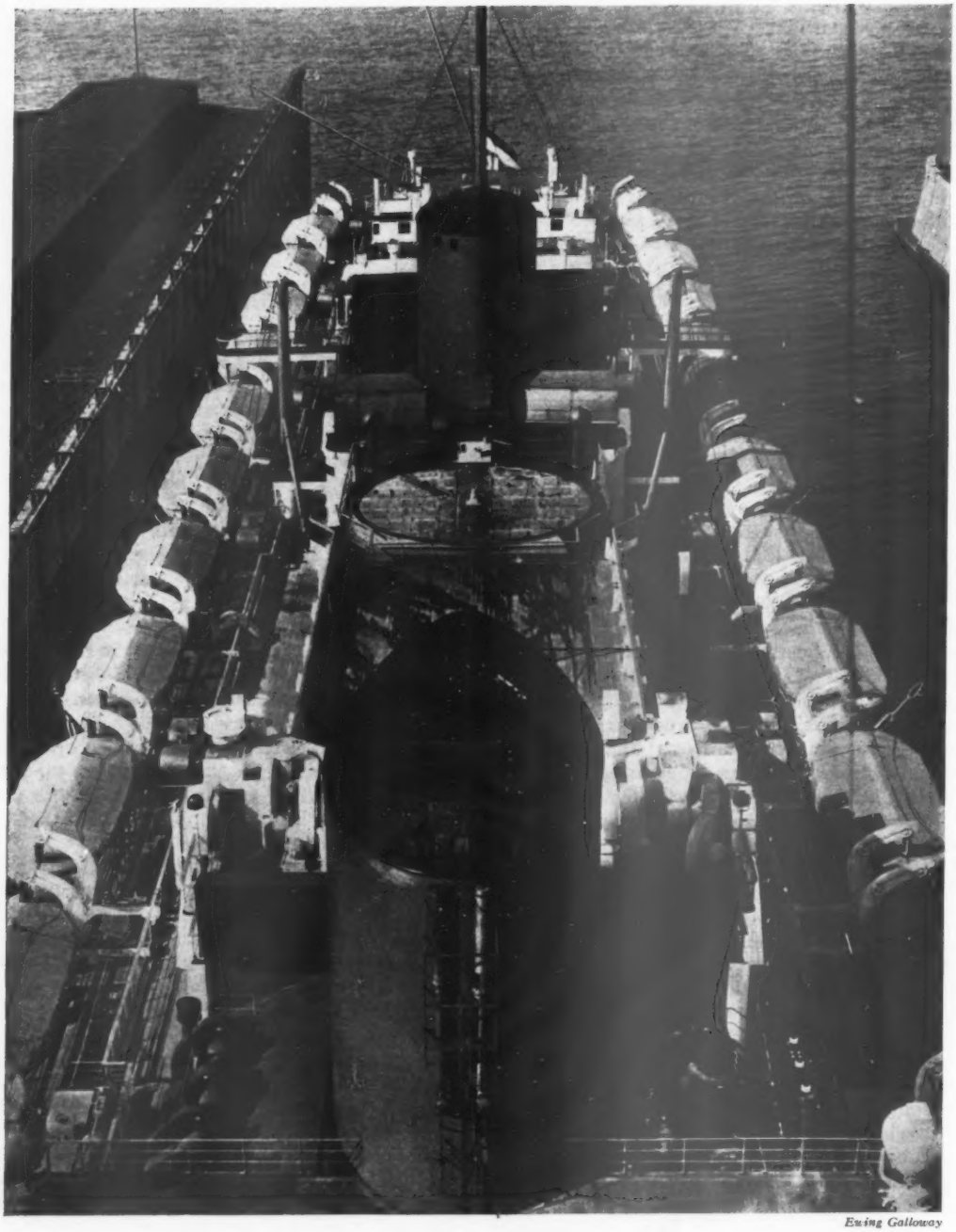
"This is an ominous situation. It explains the fact why we have such remarkable captains of industry at present, but it is full of menace for the future, for industry itself depends in the last instance upon the discoveries of the great scientists; and if we have no great scientists we shall have in the long run no great industries.

"In former times we had a fairly satisfactory situation, for what the thinker needs above all is serenity of mind and the chance for protracted and undisturbed thought. At the present time these conditions have disappeared and especially in this country they are absent.

"For in this country we have to fight not only against the consequences of the price revolution which has been taking place all over the world, and which only tends to accentuate the disparity between the remuneration of those who amuse us and those who instruct us, but we have in addition the unstable condition of American life with the perpetual worries, the continual uncertainties and the constant extremes."

Coming from a sociologist, Professor Seligman's remarks take on a unique value. The usual cry today from the ranks of the humanists is that science occupies a too dominant position in modern life.

Engineering Closeups



Ewing Galloway

FROM THE CROWS' NEST

Looking down the S. S. Bremen, *the new Queen of the Atlantic, and the highest-powered passenger vessel afloat. The interior construction of the funnels is revealed and the arrangement of the life boats shown.* *See page 248*

BOOKS

Beauty In Engineering

BRIDGES: A STUDY IN THEIR ART, SCIENCE AND EVOLUTION, by Charles S. Whitney. $20.00. 363 pages. New York: *William Edwin Rudge.*

IT would be difficult to find a more inspiring challenge to both architects and engineers than is contained in the following quotation from the foreword of Mr. Whitney's book on bridges: "The purpose of this book is to give a method for the application of fundamental architectural principles to the design and criticism of bridges; to point out that the modern bridge should not, as is sometimes stated, be exempted from the same rules of art that apply to other architectural works; and to make a plea for thorough architectural training of the Civil Engineer that his tremendously important works may be as inspiringly beautiful as they are economically sound."

He speaks in successive paragraphs of the historical background of the modern bridge, of the varied collection of photographs that he has assembled as an inspiration for future design, but the paragraph quoted above is a clarion call to the modern designer, whether engineer or architect, to learn from the past that a bridge not only may, but must be beautiful as well as useful.

Throughout his text and illustrations, Mr. Whitney shows a nice appreciation of the extent to which the bridge typified the local resources, the prevalent culture, or the changing climates of countries and civilizations of which it was the product. He says that "bridges typify progress more than any other structure built by man." He might well have added, what in my opinion is equally true, that no man-made structure has more individuality, more positive personality than a bridge. This personality is composite primarily of the particular conditions that called it forth, plus the characteristics of its builder and the material of which it is built.

The bridge as a problem furnishes a perfect meeting ground for architect and engineer. It is incomplete and unsuccessful unless it calls forth the best of each, and no better subject for a joint effort to glorify the unity of beauty and utility could be found.

The program that confronted the old bridge builders presented appalling difficulties. Take such a bridge as that of St. Bénézet at Avignon where two great streams separated by an island are to be spanned — calling for twenty-three masonry arches across a river of formidable flood possibilities, to be so contrived at the same time as to be readily defended, and yet this was accomplished when France had scarcely emerged from the Dark Ages. It was achieved then, and that so little of it (only four arches) remain for us to see today, is due more to the destruction of man in blowing up some of the arches that were never properly rebuilt, than to the forces of nature.

The material presented is of value and interest to the reader whether student, layman, or practising engineer or architect. The text with its careful analyses of the individual designs, its historical references and the bibliography unite with the illustrations to make a volume that should meet a wide demand and stimulate a better understanding of the bridge both past and present.

He has, I am sure, had a happy time wandering through the pages of the famous works on bridges by DeDartein and by Séjourné, also in choosing this varied assortment of photographs, but he has furthermore pointed out a need in our modern world which I am confident both architect and engineer will be eager to meet, and for which I feel a personal debt of gratitude.

WILLIAM EMERSON

Milk

THE MOST NEARLY PERFECT FOOD, by Samuel J. Crumbine, and James A. Tobey, '16. $2.50. xi + 293 pages. Baltimore: *Williams and Wilkins.*

THERE is something in the modest yet intriguing title of this book that at once creates a curiosity as to its contents. Everyone familiar with modern nutritional literature knows at once that it is a book which, rightfully, will extol the food value of milk. But is it like the many other books on milk that have made so large a contribution to the library of the food technologist and the nutritionist? To write a new and authoritative book on this subject in a manner that will command the interest of the popular reader as well as the specialist demands unusual skill in the art of presentation, yet this is what has been accomplished with great success.

In the modest preface it is at the outset recognized that books on nutrition and on dairy science are numerous and filled with valuable information and the authors state that since there was no modern text devoted entirely to a popular presentation of all the interesting phases of the one nearly perfect food, they have felt justified in preparing this volume on the history, production, practical use, sanitation and dietary functions of milk and its products. The reader will agree with them in this respect.

In ten chapters there are here presented in most readable form the results of a vast amount of investigation regarding milk, its production and its importance to mankind. Reversing the usual formula of first emphasizing the significance of milk in infant feeding, they have devoted the first chapter to the broader and more general significance of milk to the race, under the appealing caption — *One Way to Defer Old Age* — and in this semi-historical, semi-philosophical treatment one of the principal aims of the book has been epitomized. Some of the following chapters expand this thesis, adding fact to fact and argument to argument, until there has been presented a comprehensive yet compact statement of our present knowledge of the relation of milk to human nutrition. This has been done with such admirable balance, with such clarity of statement and in so (*Continued on page 260*)

Reunion Plans

AS The Review goes to press, information comes by long distance telephone from Thomas C. Desmond, '09, that arrangements have been completed for the scientific demonstration which is to take place at the Reunion Banquet on the evening of June 7. It is to be in charge of John Bellamy Taylor, '97, consulting engineer of the General Electric Company, and is to be entitled "Audible Light." It will illustrate new developments in the field of "narrowcasting" as distinguished from broadcasting. More complete information will be given in the next issue of the *Reunion Bulletin*.

Swampscott, Mass., the 1925 summer home of former-President Coolidge, has been chosen as the scene of the Outing on June 7. Swampscott is beautifully located on the North Shore of Massachusetts Bay, and the New Ocean House, the center of the Outing, has admirable facilities for entertaining the 2,000 or more people who will be present during the Reunion. Harry J. Carlson, '92, Chairman of the Outing Committee, announces that the entire grounds of the New Ocean House, including a golf course, putting green, tennis courts, bath houses, and baseball diamond, will be at the disposal of Technology. Arrangements are also being made with nearby golf clubs so that ample facilities may be had for playing golf.

Transportation by automobile and bus from Boston and Cambridge will be provided by the Reunion Committee both to and from Swampscott. The schedule provides for arrival between 9:30 and 10:00 o'clock on Saturday morning, and departure about 4:00 o'clock, leaving ample time for all the guests to prepare for the big banquet Saturday evening. A buffet luncheon will be served in the convention hall of the hotel.

Class Secretaries are now making plans for the Class Dinners which are to be held on the evening of June 6. Announcements of time and place of these dinners will be included in one of the forthcoming *Reunion Bulletins* which are being sent to all Technology men by the Reunion Publicity Committee. For the benefit of all Alumni who are coming from New York or by way of New York, arrangements have been made for transportation on the Eastern Steamship *New York* which plies between Boston and New York. The entire accommodations of the boat have been reserved and plans made for a special dinner and entertainment on board.

Reservations should be made with Robert J. Marlow, '17, Room 3211, 120 Broadway, New York City. Mr. Marlow can be reached by telephone at Rector 6171. The fare from New York to Boston is $6.50, and stateroom tickets range from $2.50 to $10.00. Reservations may also be made for Sunday evening for the return trip to New York. The sailing time of the boat both from Boston and New York is 5:00 P. M.

Reunion headquarters have been established in Room 3-207, M. I. T., and all inquiries should be addressed to that place, or else to one of the Reunion Vice-Chairmen of whom there are thirty-three distributed throughout the country. Their names and addresses are included in the *Reunion Bulletin* which has been sent to the entire Institute list of former students.

Transportation information may be obtained from Emmons J. Whitcomb, '11, at the office of Raymond and Whitcomb Company, 126 Newbury Street, Boston, Mass. Information about hotels may be obtained from Ralph T. Jope, '28, Chairman of the Committee on Hotels and Housing, who may be reached at the Reunion Headquarters at the Institute.

The Reunion Committee has been able to secure the largest Guaranty Fund ever raised for a Technology Reunion, and it is still growing. With so excellent a financial backlog, the Committee is able to assure all those who expect to attend the Reunion that the prices for the various events will be extremely low.

Since the *Reunion Bulletin* was printed, Merton L. Emerson, '04, and Donald G. Robbins, '07, have been appointed to the Reunion Executive Committee.

143d Alumni Council Meeting

ON January 27 the Alumni Council held its first 1930 meeting by a thorough-going discussion of the Reunion plans outlined above. After having the usual dinner served in Walker Memorial, the Council listened patiently to a report of the excellent financial condition of the Association, and then heard with approbation Samuel C. Prescott's ('94) description of the work of the Student Faculty Committee which has been studying the Institute's curriculum and methods of instruction. Organized two and a half years ago, the Committee has made many helpful suggestions toward improving the Institute courses and creating a better *esprit de corps* among the Faculty and the students.

The remainder of the evening was devoted to a discussion of the Reunion, under the leadership of Thomas C. Desmond, '09, General Chairman of the Reunion. The selection of the New Ocean House at Swampscott for the scene of the Outing was the result of the Council's discussion of this item on the Reunion program. It was pointed out that Swampscott was easily accessible and provided opportunity for outdoor sports and adequate room for shelter and indoor games in case of rain.

Harold B. Richmond, '14, Vice-President of the Alumni Association, presided over the meeting, the President of the Association, Paul W. Litchfield, '96, being unable to attend. He reported for the Committee to Nominate Representatives of Local Associations on the Alumni Council, the election of Charles R. Haynes, '04, to succeed Mitchell B. Kaufman, '15, as Council Representative of the Technology Club of Norway (Oslo), and the election of Elbert G. Allen, '00, to replace Edward L. Moreland, '07, as Representative of the Technology Club of the South (New Orleans).

Fifty-three members and guests attended the meeting.

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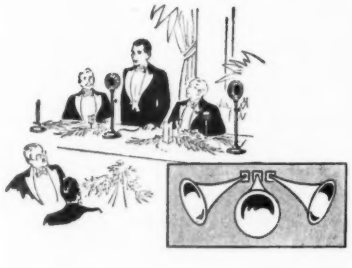

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CAN AMERICANS BE SCIENTISTS?

(Continued from page 236)

In astronomy the United States now stands preëminent, both in the number of her recognized contributors and in the nature of her equipment. Her contributions during the first quarter of the Twentieth Century far outrank those of any other nation. Rutherford, Pickering, Abbe, Newcomb, and Hill are names marking definite mileposts in the science of astronomy. Rutherford (1816–1892) was first to construct a photographic refractor and to apply the methods of photography to the determination of stellar positions. Pickering (1846–1919) elaborated upon Rutherford's work and discovered the first spectroscopic system of binary stars. Photographic and spectroscopic methods of stellar research are of the first importance everywhere today. Abbe (1838–1916) perfected the weather forecasting service for the United States Government, and his methods were later copied all over the world. America is now foremost in this department, through the subsequent work of the Smithsonian Institution. The establishment of an observing station on Mount Brukkaros in South Africa, which will be linked by radio with two other American stations, one in South America and the other in California, will provide still more accurate and comprehensive weather statistics. Newcomb (1835–1909) and Hill (1838–1914), distinguished mathematical astronomers, both received world-wide recognition. They applied the Newtonian formulae to involved problems of celestial mechanics, especially to the movements of the moon and the outer planets. Hill ranks with Laplace in devising helpful equations for the study of three bodies acting simultaneously on one another in space. The three greatest observatories in the world are in the United States: the Yerkes Observatory of the University of Chicago, at Williams Bay, Wisconsin; the Carnegie Institution's Observatory on Mount Wilson, California; and the Lick Observatory on Mount Hamilton, California.

These are just the high spots of America's accomplishments in pure science. In a brief article one can do little more. But one thing is clear — America in physical science has always been much more than merely a practical nation. Even in early colonial times she has produced outstanding contributors. In the Twentieth Century she is in the vanguard, and if the newer sciences of geology, biology, and psychology are taken into account she is already in the lead. She has always had the native ability and the intellectual capacity, and now, with the financial resources and the ability to secure the needed scientific equipment, we may look to a still more brilliant second quarter of attainment in the Twentieth Century.

America is eternally indebted for her rapid rise to wealth and power to the labors of such men as Galileo, Newton, Lavoisier, Franklin, Rumford, and Gibbs. She must continue to depend upon pure science for her material welfare. The scientist has been and is doing his full share. Leaders of industry and public affairs alike realize this; manufacturers and capitalists of America today, whose immense fortunes are built upon the findings of the man in the laboratory, are awake to their need of the services of men of science, and the *(Continued on page 256)*

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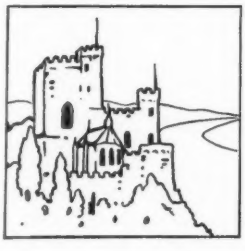

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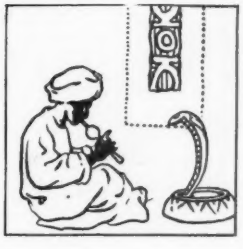

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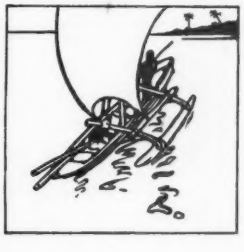

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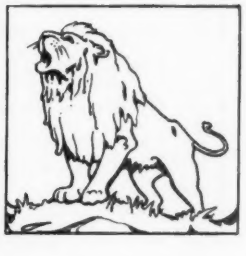

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CAN AMERICANS BE SCIENTISTS?

(Concluded from page 254)

laboratory with its personnel has begun to appear as an integral part of the plans and the programs of an increasing number of vast business corporations. Laboratories in universities and other centers of research are commanding a recognition and giving an opportunity that at once indicates the necessity and insures the acceptance of research in all fields of science. Whatever can be done to further education in the meaning of science and in the realization of the need for proper support of research and its workers will be to the immeasurable advantage of humanity and of science alike.

BUSINESS DISCOVERS HEALTH

(Continued from page 238)

fact, provided they retain all of the important qualifications and pervert none of the findings. On the other hand, if the coffee interests launched a campaign to induce young children to imbibe coffee, they would be guilty of a reprehensible act. That exigency has not arisen.

The limited amount of chicanery which unfortunately exists alongside of the ethical endeavors by reputable commercial agencies having health messages is being drastically dealt with by industry itself. For sixteen years the National Better Business Bureau (New York), has been carrying on a zealous campaign for the purification of advertising and the extermination of quackery and charlatanism. This "agency of self-discipline" for industry has issued valuable bulletins on obesity remedies, on mail order spectacles and eye courses, and on cures for drug, liquor and tobacco habit, and has recently completed studies on hair dyes, gynecological remedies, piles remedies, weak men cures, and asthma cures, all subjects in which the gullible are prone to succumb to the wiles of the quack. Industry also cooperates fervidly with the American Medical Association in its laudable endeavors to assure truth and reliability in the literature of medicinal and therapeutic preparations. Better Business is likewise closely in touch with the federal bureaus concerned with such matters.

So long as industry maintains the ideal of public service, the consumer can always put his faith in the health educational material of the many reputable concerns legitimately in this field. The activities of this vast and powerful army of commercial forces must be mobilized so as to produce coördinated results of benefit to organized public health. A commercial health council, with a central headquarters, analogous to that of the National Health Council, the clearing house for the leading national voluntary health agencies of the country, would be a forward step.

Organized medicine and public health should utilize these industrial agencies to the utmost extent. Public health needs business as an ally and will invariably derive advantages from the relationship. There is absolutely no danger of commercial control of medicine or of public health. A leading health official resigned from the American Public Health Association several years ago because in his opinion it was dominated by a certain powerful life insurance company. Various physicians have disgorged themselves (*Concluded on page 258*)

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BUSINESS DISCOVERS HEALTH

(Concluded from page 256)

of articles from time to time, usually with some such misguided title as "The Menace to Medicine," in which they have deplored the fancied regulation of medicine by commercial lay groups. As a matter of fact, it is the reverse which is true. Medicine and public health, when liberal, tolerant, and reasonable, can make skillful use of these business agencies and can divert their undeniable potentialities to their own legitimate ends.

"If the medical profession wants business concerns to come to it for the advice which it should give, medicine must be willing to coöperate effectively with business," wrote a former president of the American Medical Association in a recent letter to the *Journal* of that association. "Physicians must take a constructive course in such situations," he continued, "or cease to criticize or oppose. We are constantly fighting dishonesty in business. To be consistent and fair we must support honest business." This physician, as a leading dermatologist, had assisted a well-known soap manufacturer to collect expert opinions, based on examinations, to the effect that a first class toilet soap may benefit the skin. In an advertisement he certified to the authenticity of the statements, and for this he was criticized by some of the more conservative members of the profession. His letter outlined his creed on such matters and is notable for its broad-minded viewpoint.

Business is best as an ally, for business is really at the foundation of all health progress. The financial support of all official health agencies is secured from taxes levied on business, or made possible by commerce. The few who scoff at scientific workers attached to industry are invariably sneering at the system which produces their own salaries, or makes possible their incomes. The great foundations which have done and are performing much valuable and constructive public health work, all owe their existence to the vision of industrial leaders. The Rockefeller, Russell Sage, Milbank, and Commonwealth Foundation funds emanated from business, and not from millions made from professional careers. A scientist can have just as honorable a connection with the original business as with an institution whose income may come from dividends on the capital stock of that same business.

Modern industry has, then, much to contribute to the science of public health, and sanitary and medical science have much to contribute to business. Real progress can and will be achieved by a joining of forces in a coöperative spirit. Adjustments may have to be made in many instances, but each side has so much to gain by the alliance that each can afford to be liberal in its attitudes. After all, the goal of all of us is the prosperity and happiness of the nation and that can be achieved only through the advancement of national vitality and health.

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BOOKS

(*Continued from page 251*)

interesting a way that the reader becomes absorbed at once, subconsciously recognizing what may be called the romance of the subject, yet always conscious of the soundness of the science.

But history and literature, as well as science, mark this book. The third chapter, dealing with the subject, *Milk Through the Ages*, gives an historical account of the place of milk in the foods and civilizations of earlier periods in man's history, and there are presented here statements which clearly indicate the delving into ancient records and the perusal of the literatures of ages long past. It is clearly shown that from the dawn of history milk has been highly regarded and has had a place in the chronicles of man's affairs. More than two pages of Biblical references are given, and there are many others which make this chapter one of great historic and literary interest.

It is doubtful if any other book on the subject has ever presented so much authoritative material in so brief a space and so interesting a way. One minor error in dates was noted, as it was in 1890 and not in 1892 that the first survey of a city milk supply was made by Professor Sedgwick in Boston, although probably the results were not broadcast through scientific publication until the latter year. The authors deserve the congratulations, thanks, and the praise of the reading public.

SAMUEL C. PRESCOTT, '94

Every Man His Own Weather Man

THE STORY OF THE WEATHER, by Eugene Van Cleef. $2.50. xii+274 pages. New York: *The Century Company*.

THE task which the author set himself in writing "The Story of the Weather" would be fully justified if he accomplished nothing more than to give some semblance of interest and authority to the trite forecasts and conjectures in which weather is employed as a salutatory jimmy for breaking into conversation. If the man who now greets one with "It looks like rain" should one day make the astonishing prophecy that the direction of the wind, the temperature and the cloud formation indicated sleet by noon, there would be some excuse for his existence.

Professor Van Cleef, however, who is a member of the Department of Geology at the Ohio State University, has a more serious purpose. His interesting and always lucid discussion of climate, winds, cloud formations, storms, seasons, and methods of forecasting weather conditions brings a clear conception of the part that weather plays in life, whether it be a question of choosing a fine day for a picnic, or in business and industry, where the difference between "fair and warmer" and "cloudy with rain" may spell success or disaster.

The author suggests that manufacturers give more study to the climatic conditions in foreign countries to which their products are shipped.

JOHN J. ROWLANDS

(*Concluded on page 264*)

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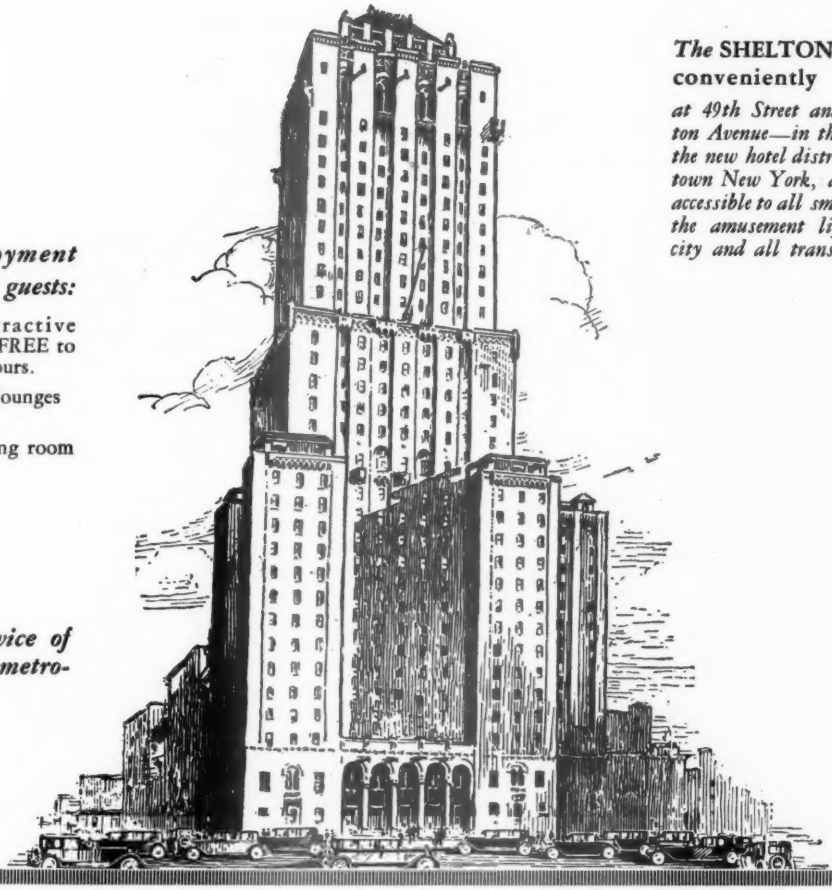

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BOOKS

(*Continued from page 260*)

Partisan History

THE TRAGIC ERA, THE REVOLUTION AFTER LINCOLN, by Claude G. Bowers. $5.00. xxii+566 pages. Boston: *Houghton, Mifflin and Company*.

AS A HISTORIAN Mr. Bowers proves quite unconsciously that the Sachems of the Democratic party were right in selecting him to give the keynote speech at their last national convention, as his historical judgment seems to have been guided by a deep devotion to the idea that the act of a Democrat is righteous and that of a Republican foul. His story of the violently partisan period from 1865 to 1876 is as good history as could be written by anyone active in party politics, and will no doubt seem a scholarly and unbiased work to Southerners and Democrats.

In the matter of exhaustive research it is scholarly; it is in the interpretation of facts and motives that the author's Democratic rearing shows itself. Against Republican guilt he doth protest too much. He assumes that the Reconstruction Acts were passed wholly because the Radical Republicans wished to continue in power, and that the Democrats opposed the congressional program entirely out of love of justice. No doubt many Republicans acted upon just the motives he imputes to them, but many others, and probably the rank and file of the voters of the party, felt that they were making a great humanitarian reform; were protecting the negro from reënslavement.

If the name, "The Tragic Era," indicates an intention of covering American history during that period, the author has fallen down in his attempt, for he has turned his attention only upon those things that might be termed "tragic" — reconstruction, political rottenness, financial scandals — and has neglected the more optimistic and, in the large view, more important movements and events of the time. This was the period when the industry of America began to stride in seven league boots, making possible that cheapening of manufactured articles which has created the high living standards of to-day; the period when millions of farmers poured out onto the great wheat lands of the trans-Mississippi region to take advantage of the new homestead act; the period in which American cities grew as they had never grown before, and a new urban civilization appeared in the country.

But Mr. Bowers virtually ignores all this and fixes his gaze on the animosities of the placemen at Washington. People interested in the machinations of politicians, the detailed story of how each vote was won or lost, will find much material here, as will those who are interested in making the acquaintance of a large tribe of Senators and Congressmen, distinguished and undistinguished. In fact, there is so much of this detail that the book is too long, and the general reader, for whom it was written, will get bogged in details and minor names.

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THE TABULAR VIEW

GREAT GRAIN ELEVATORS are being built on the shores of Lake Ontario and new harbors are being suggested as a result of the building of the new Welland Ship Canal: Government engineers have just reported favorably on the development of a harbor at Oswego, N. Y. When the canal opens in July, Lake Ontario ports will receive much of the "ex-lake" grain now being transshipped at Buffalo, and if Oswego is to take advantage of its opportunities, the suggestions of the Army engineers must be consummated. Eastern ports, such as Boston, will receive a large proportion of the trans-shipped cargoes and they are just beginning to realize the importance to them of the Welland Ship Canal development. To all interested in this aspect of America's transportation development, as well as to those interested in new engineering achievements, the article on the Welland Ship Canal on page 283 will be helpful and revealing. Its author, JOHN J. ROWLANDS, is Contributing Editor of The Review, and readers will remember his widely quoted article, "Science and the Front Page," presented in December.

FOR YEARS the textile industry has been hard pressed and unsuccessful. HIBBARD S. BUSBY, '14, Director of the A. French Textile School of the Georgia School of Technology, undertakes a diagnosis on page 288. Mr. Busby's career has led him into the paper industry, into the cost department and engineering division of a silk mill, and into the laboratory as a research colorist. It is interesting to observe that the Institute of Technology has anticipated Professor Busby in some of his suggestions in that it has extended its work in textile engineering not only to students but to textile executives and directors who wish special intensive training in fundamental research by offering a course of seventeen hours a week for six weeks. Men busy in the industry have been able to avail themselves of the opportunity without greatly interfering with their regular work. With enlarged research laboratories under the direction of PROFESSORS GEORGE B. HAVEN, '94, and EDWARD R. SCHWARTZ, '23, special courses have also been offered to the graduates of the various textile schools of the country. Two options have been available; one for those wishing to specialize in manufacturing problems which may be summarized under the general term of textile engineering and the second for those desiring training in chemistry, bleaching, dyeing, and similar subjects in the field of textile chemistry.

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(Concluded on page 278)

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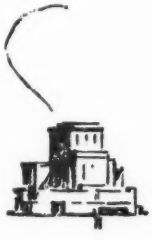

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THE TABULAR VIEW

(Concluded from page 276)

sion." It is in this manner that the subject of MR. NOLEN's article on page 291 is described in "The New Interior Decoration," by DOROTHY TODD and RAYMOND MORTIMER. LE CORBUSIER is becoming more and more recognized as an outstanding figure in contemporary architecture, and his suggestions for the replanning of our cities have received wide attention. MR. NOLEN, who reviews his work, is a city planning landscape architect who has achieved eminence in his field. He holds degrees from the University of Pennsylvania, Harvard, and Hobart and in 1900 he studied at Munich. He has designed and supervised the building of innumerable civic and suburban developments and he has acted as adjudicator of the competitive designs for the city plan of Dublin, Ireland. He has been associated with the New York Regional Plan and is Past President on the National Conference on City Planning, and of the American City Planning Institute. He is the author of "Madison, a Model City," "Replanning Small Cities," "New Ideals in the Planning of Cities, Towns, and Villages," and "New Towns for Old." It is evident that he brings to his discussion of LE CORBUSIER and to his commentary on PROFESSOR and MRS. HUBBARD's "Our Cities Today and Tomorrow" an immense amount of experience and learning. ¶ DR. JAMES A. TOBEY, '15, is a frequent contributor to The Review. His "Business Discovers Health" appeared in the last issue.

THE REVIEW for May will be the largest issue ever published. It will contain an important article by JAMES TRUSLOW ADAMS, "Is History a Science?"; a timely admonition to print collectors by CHARLES CHILDS; a survey of science and engineering in Sweden by DR. WALDEMAR LINDGREN; and a biographical sketch of KARL T. COMPTON, President-Elect of the Institute. There will be reproduced a series of beautiful industrial photographs by MARGARET BOURKE-WHITE. The issue will exemplify The Review's policy of presenting science and engineering not dully or prosaically, but with imagination, interpretation, lucidity, and a sense of beauty. There is a demand for a journal that views the world through the eyes of the scientist and engineer and The Review is responding to this demand. In doing so it aims to be accurate, authoritative, and free from sensationalism.

THE SUBJECT reproduced on the cover of this issue is a water color, "T-Wharf," by NELSON CHAUNCY CHASE, '17, an instructor in the Institute's Department of Architecture. MR. CHASE has done many delightful water colors and undoubtedly Review readers are already acquainted with his series of the Institute. He also had a hand in designing the present cover series. ¶ The Review is desirous of locating water colors of engineering and technical subjects. Some are already known to the Editors but they would like to know of others for possible reproduction.